

FORMULATION AND EVALUATION OF METAMIZOLE Na TABLETS WITH DIFFERENT CONCENTRATIONS OF SWEET POTATO FLOUR (*Ipomea Batatas* L.) AS DISINTEGRATOR

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ABSTRACT

Sweet potatoes have a fairly high starch content, namely 84.89%. High levels of starch can be used as a disintegrating agent in the manufacture of pharmaceutical preparations, namely tablets. The aim of this research is to determine the effect of variations in the concentration of sweet potato flour as a disintegrating agent and to determine how sweet potato flour is a candidate disintegrating agent in making tablet preparations using experimental methods in several concentrations on the properties and physical properties of Metamizole Na® tablets. Based on the results of this research, 3 formulations were made, namely formulation I (2.5%), formulation II (5%), formulation III (7.5%). The results obtained from this research indicate that formulation I is the best formulation of the other 3 formulas because formulation I is the formulation whose results in each test are closest to the positive control.

Keywords : Disintegrator, Metamizole Na, Tablets

INTRODUCTION

Sweet potatoes are one type of tuber that is often found in Indonesia. Sweet potatoes have a fairly high starch content, namely 84.89%, which can be used as a disintegrating agent in making tablet preparations.

Tablet preparations are solid preparations that are very often used. Tablets are compact solid dosage forms, made by molding, in the form of a flat or circular tube, both flat or convex surfaces, containing one or more types of medicine, using or not using additional ingredients. Additional materials or excipients can act as fillers, developers, binders, wetting agents or other suitable materials (Ministry of Health of the Republic of Indonesia, 1979). There are several other additional materials used in the tablet manufacturing process, namely fillers, binders, lubricants and disintegrants.

Crushing agents are materials used to assist in the process of breaking down tablets into small particles (Rahayu et al., 2017). There are two methods for adding crushing materials, namely internal and external addition (Lieberman et al., 1989). Therefore, in this research, sweet potato was used as a disintegrating agent in tablets.

METHODS

This research is a type of experimental research. The research was conducted at the FAKAR Pharmacy Study Laboratory, Strada Indonesia Institute of Health Sciences. The research was conducted for 1.5 months. This research includes the sample preparation stages, making sweet potato flour, making preparations using the wet granulation method, providing the physical properties of the granules and providing the physical properties of the tablets (weight uniformity, tablet friability, disintegration time and dissolution).

RESULTS

A. The Production of Porang Tuber Flour

The sweet potatoes are washed thoroughly in running water, then sliced thinly, then the sweet potato slices are dried in an oven at 50°C for 3 hours. The dried sweet potatoes are then mashed until the texture turns into flour using a blender

B. Granule Flow Time Test

The results of the granule flow time test can be seen in the tablet below :

Table 1 Result of the granule flow time test

Formulation	Flow Time (second) ± SD
Formulation I (concentration 2,5%)	2,84 ± 0,073
Formulation II (concentration 5 %)	2,84 ± 0,081
Formulation III (concentration 7,5%)	2,78 ± 0,052
Control (-) (without desintegrant)	2,79 ± 0,051

From the table above it can be seen that the flow time for all formulations has a flow time of less than 10 seconds. Therefore, all formulations meet the flow time test requirements, namely less than 10 seconds (N.F et al., 2020).

C. Granule Angle of Repose Rest

The results of the granule angle of repose test can be seen on the tablet below

Table 2 Results of the granule angle of repose test

Formulation	The Angel of Repose (°) ± SD
Formulation I (concentration 2,5%)	34,46 ± 3
Formulation II (concentration 5 %)	37,47 ± 2
Formulation III (concentration 7,5%)	35,51 ± 3
Control (-) (Without desintegrant)	34,88 ± 1

From the results above, it is known that all formulations meet the requirements for granule angle of repose, namely not less than 280-420 (Candra et al., 2018).

D. Tablet Weight Uniformity Test

The results of the weight uniformity test can be seen in the table below :

Table 3 Results of the weight uniformity test

Formulation	Weight Uniformity (mg) ± SD
Formulation I (concentration 2,5%)	687 ± 1,627
Formulation II (concentration 5 %)	622 ± 2,160
Formulation III (concentration 7,5%)	618 ± 1,065
Control (-) (without desintegrant)	601 ± 0
Control (+) (Metamizole Na)	602,3 ± 6,35

E. Tablet Hardness Test

Tablet hardness test results can be seen in the table below Tabel 1 Hasil uji kekerasan tablet

Table 4 Result tablet hardness test

Formulation	Tablet Hardness (kg) $\pm$ SD
Formulation I (concentration 2,5%)	7,53 $\pm$ 0,723
Formulation II (concentration 5 %)	6,71 $\pm$ 0,318
Formulation III (concentration 7,5%)	4,07 $\pm$ 0,075
Control (-) (without desintegrant)	2,62 $\pm$ 0,125
Control (+) (Metamizole Na)	14,27 $\pm$ 1,190

F. Tablet Friability Test

Table 5 Result of tablet friability test

Formulation	Tablet Friability (%) $\pm$ SD
Formulation I (concentration 2,5%)	0,616 $\pm$ 0,070
Formulation II (concentration 5 %)	0,736 $\pm$ 0,518
Formulation III (concentration 7,5%)	0,783 $\pm$ 0,076
Control (-) (without desintegrant)	0,513 $\pm$ 0,194
Control (+) (Metamizole Na)	0,15 $\pm$ 0,194

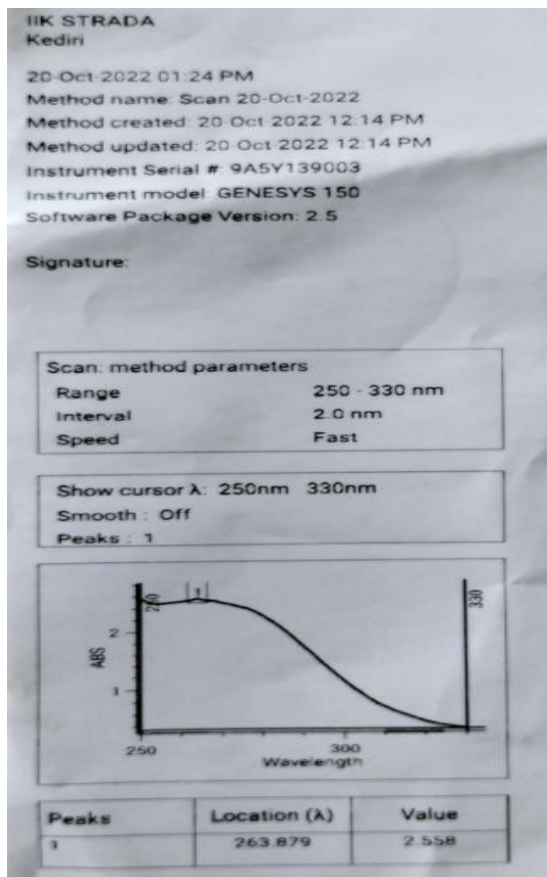
G. Disintegration Time Results

Table 6. Result of disintegration time results

Formulation	Desintegrator Time (minute) $\pm$ SD
Formulation I (concentration 2,5%)	4,9 $\pm$ 0
Formulation II (concentration 5 %)	2,871 $\pm$ 1,421
Formulation III (concentration 7,5%)	1,641 $\pm$ 0,710
Control (-) (without desintegrant)	6 $\pm$ 0
Control (+) (Metamizole Na)	13,124 $\pm$ 0,710

H. Examination of Tablet Dissolution

- Determination of maximum wavelength ($\lambda_{\max}$)



- Calibration Curve Data

Table 7 Calibration Curve Data

Concentration (ppm)	Absorbance (nm)
5	0,281
10	0,337
15	0,396
20	0,484
25	0,572
30	0,695
35	0,804

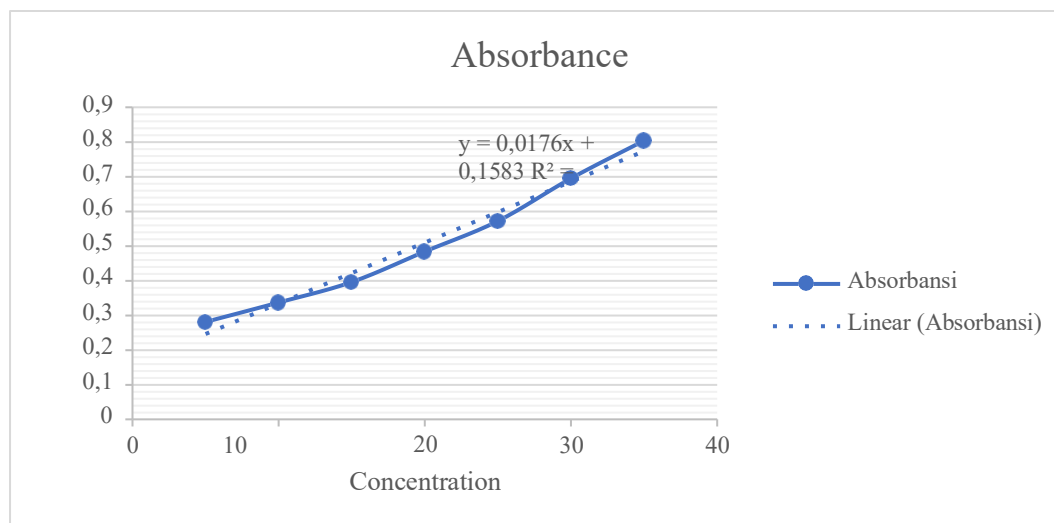


Table 8 Dissolution Test Result

Formulation	Dissolution (mg) ± SD					
	5 minute	10 minute	15 minute	30 minute	45 minute	60 minute
Formulation I	278,714 ± 2,106	293,392 ± 3,149	323,657 ± 0,638	350,229 ± 0,602	408,278 ± 0,520	430,797 ± 0,142
Formulation II	216,744 ± 0,542	287,293 ± 1,985	301,782 ± 0,142	315,589 ± 1,505	385,096 ± 0,300	388,505 ± 0,300
Formulation III	252,710 ± 3,737	295,607 ± 1,269	313,145 ± 0,537	315,948 ± 2,179	284,888 ± 0,867	388,335 ± 0,113
Control (+)	349,926 ± 3,568	364,396 ± 0,678	404,074 ± 0,542	411,517 ± 2,760	424,131 ± 2,699	500,324 ± 0,284
Control (-)	196,535 ± 2,838	238,013 ± 5,777	243,089 ± 1,364	248,562 ± 1,109	303,164 ± 0,113	305,437 ± 0,260

DISCUSSION

This research aims to determine the physical properties of Metamizole na tablets using sweet potato flour (*Ipomea Batatas L.*) as a crushing agent. This research carried out tests on the physical properties of granules which included angle of repose tests and flow time tests. Meanwhile, testing the physical properties of tablets includes tablet uniformity, tablet hardness, tablet friability, disintegration time and dissolution.

Before conducting research, sweet potatoes (*Ipomea Batatas L.*) were determined first at UPT Materia Medika, Batu Malang City to find out the correct identity of the sweet potatoes to be studied. This is done with the aim of ensuring whether the plant used has the correct identity (Sawiji et al., 2020).

During granulation, flow time and angle of repose were tested. Based on the tests that have been carried out, the average flow time for formulation I is 2.84 seconds, formulation II is 2.84 seconds, formulation III is 2.78 seconds and control (-) is 2.79 seconds and it can be concluded that the results have met the requirements good physical quality of granules. With this we can obtain that the granules meet good flow properties. From these results it is known that the flow time in all formulations from formulation I, formulation II, formulation III and Control (-) has a flow time of less than 10 seconds. Therefore, all formulations meet the flow time requirements of less than 10 seconds (N.F et al., 2020).

In testing the angle of repose by calculating the height and radius of the granule, the angle of repose is carried out using the following formula $\tan \alpha = h/r$. The angle of repose is the maximum angle formed by the powder surface with the horizontal surface during testing (Rijal et al., 2022). Granules are said

to be good when the angle of repose obtained is not less than 280-420 (Candra et al., 2018). From the results of the angle of repose test, formulation I, formulation II, formulation III and control (-) meet the requirements of the granule angle of repose test.

Tablets are subjected to a weight uniformity test, the results obtained must not be more than 2 tablets that deviate from the average weight by more than column A and there must not be a single tablet that deviates from the average weight determined by column B (Murtini et al., 2018). In each formulation the weight obtained did not have deviations in the weight determined by column A and column B. The results of the weight uniformity test in this study showed that the average weight was 687 mg for formulation 1, 622 mg for formulation 2, 618 mg for formulation 3, control (-) 601 mg, control formulation (+) namely Metazimole Na® tablets amounting to 602 mg. Meanwhile, the difference between the weight of the resulting tablet and the desired tablet weight is that in formulation 1 it is 17.561%, formulation 2 is 16.96%, formulation 3 is 8.292%, control formulation (-) is 19.776% and control (+) is 19.688%. This happens because there are variations in the speed of the punch as it descends into the die, resulting in varying weights.

Tablet hardness testing is carried out by taking 1 tablet and then using a hardness tester by placing the tablet on the hardness tester, setting the tool to kg, turning the tool clockwise until the tool beeps, recording the results. This test was carried out 3 times in replication. From the test results, it was found that the hardness of formula 1 was 7.53 kg, formula 2 was 6.71 kg, formula 3 was 4.07 kg, control formulation (-) was 2.62 kg. This shows that not all formulations meet the requirements. Formulation 1, formulation 2 and formulation 3 meet the tablet hardness test requirements, while the control formulation (-) does not meet the tablet hardness test requirements because it is below 4-8 kg (Rustiani et al., 2019).

Tablet friability testing was carried out by weighing 20 tablets, then the tablets were inserted into the friabilator tester, set at a speed of 25 rpm for 4 minutes, the tablets that were still intact were weighed and then recorded. According to (Vellinda, 2021) the requirement for tablet fragility is no more than 0.8%. In this study, results were obtained for all formulations below 0.8%. The results were tested statistically, the normality test had a significant value of 0.000 and the homogeneity test had a significant value of 0.001. The results of the homogeneity test were less than 0.05, so the Kruskal Wallis test was carried out. The results of the Kruskal Wallis test showed a significant value of less than 0.05, which can be said to be a significant difference, so it was continued with the post hoc test.

Disintegration time testing is carried out by preparing distilled water and putting it in a 1 liter beaker glass, attaching the beaker glass to the disintegrator tester. Set the tool at a temperature of 37°C, after the distilled water temperature reaches 37°C, put 6 tablets in each tube, then hook the tube to the disintegrator tester, run the tool and set the time for 15 minutes (MOH RI, 2020). All formulations met the disintegration time test requirements, namely < 15 minutes. The results were statistically tested in the normality test with a significant value of 0.013 and in the homogeneity test a significant value of 0.002. The results of the homogeneity test and normality test were less than 0.05, so the Kruskal Wallis test was carried out. The results of the Kruskal Wallis test showed a significant value of less than 0.05, which can be said to be a significant difference, so the post hoc test was continued.

Dissolution testing aims to determine the rate of drug release. The results of the dissolution test in this study showed that each formulation had an increase in the dissolution rate every minute. According to pharmacopoeial requirements the dissolution of tablets is not less than 80%. The dissolution test results for all formulations had a value of more than 80%. The results were statistically tested in the normality test with a significant value of 0.200 and in the homogeneity test a significant value of 0.000. The results of the homogeneity test and normality test are less than 0.05. So the Kruskal Wallis test was performed. The results of the Kruskal Wallis test showed a significant value of less than 0.05, which can be said to be a significant difference, so the post hoc test was continued.

CONCLUSION

Based on the results of the research carried out, namely the formulation and evaluation of metamizole na tablets with different concentrations of sweet potato flour (*Ipomea Batatas L.*) as a disintegrator, it can be concluded that:

1. Various variations in the concentration of sweet potato flour as a disintegrating agent can have different effects on the physical quality of the tablets produced
 2. The metamizole Na tablet formulation with sweet potato starch as a disintegrating agent 2.5% has the best physical tablet quality test among other formulations.
- Sugestion

Based on the research that has been carried out, it is recommended that future researchers use a different method and a longer dissolution time to determine the maximum drug concentration released by the tablet, and it is hoped that future researchers will analyze further.

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